the appended claims.

Claims

1. A process for increasing the efficiency of a computer for finite element simulations by automatic generation of suitable basis functions using B-splines, with the following steps:

   - definition (1) of a simulation region (Ω) and storage of the data of the simulation region (Ω);
   - input (2) and storage of boundary conditions;
   - establishment (3) of a predefinable grid width h and a predefinable degree n of the B-splines;
   - determination of a grid covering the simulation region (Ω) and the type of the grid cells;
   - classification (5) of the B-splines with support intersecting the simulation region by determining inner and outer B-splines, where for outer B-splines the intersection of the support with the simulation region is less than a predefinable bound s;
   - determination (6) of coupling coefficients $e_{i,j}$ for formation of linear combinations of inner and outer B-splines; and
   - storage and output of the parameters which determine the basis functions.

2. Process as claimed in claim 1, wherein, before storage and output of the parameters, the following step is carried out: Establishing (7) a predefinable weight function w and determining the weight points and scaling factors.

3. Process as claimed in claim 2, wherein the weight function w is established by a smooth transition from a constant plateau inside the simulation region (Ω) to the value 0 on the boundary (Γ).

4. Process as claimed in one of the claims 1 to 3, wherein the B-splines with at least one grid cell of the support contained entirely in the simulation region (Ω) are classified as inner B-splines.

5. Process as claimed in one of the claims 1 to 4, wherein the weight point is chosen as the midpoint of a grid cell of the support of the corresponding B-spline, which is contained entirely in the simulation region.

6. Process as claimed in one of the claims 1 to 5, wherein the simulation region (Ω) is defined by storage of data which can be derived from computer-aided engineering (CAD/CAM).

7. Process as claimed in one the claims 1 to 6, wherein the grid width h is automatically established using stored values obtained empirically and/or analytically by a pertinent first evaluation function.

8. Process as claimed in one of the claims 1 to 7, wherein a degree n is automatically determined using stored values obtained empirically and/or analytically by a pertinent second evaluation function.

9. Process as claimed in one of the steps 1 to 8, characterized by the following steps:

   - assembling (9) a system of equations to be solved in a FE simulation;
   - solving (10) the system of equations;
   - computing (11) an approximate solution; and
   - output (12) of the approximate solution.

10. Process as claimed in claim 9, wherein a multigrid process is used for the solution (10) of the system of equations.

11. Device for executing a process as claimed in one of the claims 1 to 10, in particular a computer system, with input devices (31,32,33) and output devices (34), storage devices (37), and a central processing unit (35,36),

where the regular grid structure is utilized for optimizing the computational process, especially by parallelization.

12. Machine-readable data medium (18), in particular magnetic tape, magnetic disk, compact disk (CD) or digital versatile disk (DVD), wherein the data medium stores a control program for a computer system (30), according to which the computer system (30) can execute a process, as claimed in one of the claims 1 to 10.